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Phonology is the Strongest Language Component in Predicting Aphasia Outcome after Stroke

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Introduction

Several studies have investigated the recovery of aphasia post-stroke. However, none of these have studied the recovery pattern of the three main linguistic levels, i.e. semantics, phonology, and syntax, which constitute the basis of diagnosis and treatment (Code, 2001). Whereas initial aphasia severity has been reported to be a robust prognostic factor (e.g. Pedersen, Vinter, & Olsen, 2004), no information is available about the significance of the separate linguistic levels in predicting the final outcome. In this observational prospective follow-up study we investigated the recovery pattern of semantics, phonology, and syntax, and factors that predict the outcome at one year post-stroke.

Methods

Patients with aphasia (n=147) were assessed at 1, 2, and 6 weeks, 3 and 6 months, and 1 year after a first-ever stroke. We used the ScreeLing to assess the patients' performance on semantics, phonology, and syntax (Doesborgh et al., 2003), and the Aphasia Severity Rating Scale (ASRS) (Goodglass & Kaplan, 1972). The differences between the 6 assessments were investigated with Mixed Model analyses. Logistic regression analyses were performed to examine the influence of the initial linguistic disorders on good outcome (ASRS of 4 or 5), and the influence of 13 non-linguistic factors, such as demographic, neurologic, and stroke characteristics.

Results

Semantics and syntax improved up to 6 weeks ($p<0.001$), and phonology up to 3 months ($p<0.001$) after stroke. ASRS improved up to 6 months ($p<0.05$). Univariable logistic regression analyses revealed a significant influence of each of the three linguistic baseline scores on good outcome: semantics, R^2=34.5%, odds ratio (OR)=1.24 (95% CI 1.13-1.36); phonology, R^2=44.9%, OR=1.33 (95% CI: 1.18-1.49); syntax, R^2=33.2%, OR=1.24 (95% CI: 1.13-1.36). Multivariable analysis based on the three linguistic levels explained 46.5% of the variance, with phonology as the only significant variable. Additionally, univariable logistic regression analyses showed that young age, high Barthel Index scores in the first week, high education level, and stroke due to hemorrhage were significant predictors. All significant predictors, including the phonology score in the first week,

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were selected for the final multivariable regression model which explained 55.7% of the variance (Table 1).

Table 1: Prognostic model for good outcome (i.e. ASRS 4 or 5) in the first week post-stroke.

	OR* (95% CI**)	p-value
Phonology score (0-24)	1.31 (1.15-1.51)	<0.001
Barthel index (0-20)	1.11 (1.00-1.21)	0.03
Age (19-96)	0.94 (0.89-0.99)	0.03
Education level		
low (*unfinished elementary school - sophomore high school*)	0.47 (0.12-1.84)	0.28
Stroke subtype		
hemorrhage	8.85 (0.70-111.28)	0.09

*OR = Odds Ratio
**CI = Confidence Interval

Conclusions

Semantics, phonology and syntax show different recovery patterns in patients with post-stroke aphasia. Phonology has the slowest recovery rate and is a strong predictor in the first week post-stroke of good outcome at 1 year, independently of Barthel Index score, age, education, and stroke subtype.

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